

8. Deliverables

8.1. Field Reports

8.1.1 Progress Sketch

The hydrographer shall submit a Monthly Progress Sketch digitally via email, to the addresses specified in the Hydrographic Survey Letter Instructions or Statement of Work no later than 5 calendar days from the end of the reported month. Progress sketches shall be constructed using a desktop Geographic Information System, capable of exporting the associated data in a format compatible with MapInfo (Version 5.0 or higher) or ArcView (Version 3.0 or higher). Other formats may be allowed, if approved in advance by the COTR.

The Progress Sketch is a page-size graphic that portrays survey accomplishments. All portions of the sketch must be neat and legible for reproduction. Every Progress Sketch shall be overlayed onto the largest scale chart of the survey area (do not include the raster chart file in email attachment, only reference chart used) and depict the following information, if applicable:

- Title block
- Statistics block
- Latitude and longitude tick marks
- Shoreline
- Geographic names of significant features
- Sheet limits
- Survey area limits
- Sheet letters and registry numbers

The title block consists of the title “Progress Sketch”, project number, locality, type of survey, inclusive dates of survey, name of vessel(s), chief of party, and approximate scale of the sketch.

The statistics block contains monthly columns showing, in rows, the following items, if applicable:

- Lineal nautical miles of sounding lines (list side scan sonar, Multibeam and/or single beam separately)
- Square nautical miles of hydrography (list side scan sonar, Multibeam and/or single beam separately)
- Number of sound velocity casts
- Number of bottom samples collected
- Number of items from the Automated Wreck and Obstruction Information System (AWOIS) completed
- Number of tide gauges installed
- Number of position control stations established

- Number of days of down time due to weather
- Number of days of down time due to equipment

Labeled latitude and longitude ticks, shoreline, and geographic names for orientation and easy identification are also shown. Distinctive hatching should be used to differentiate the areas surveyed each calendar month. Additional symbols may be used on the Progress Sketch as necessary, but should be explained in the legend.

Sheet limits, registry numbers, and letter designators are displayed on the Progress Sketch when survey sheets are begun.

8.1.2. Danger to Navigation Report

As soon as practicable after discovery, the hydrographer shall submit a Danger to Navigation Report to the addresses specified in the Hydrographic Survey Letter Instructions or Statement of Work. Timeliness is a critical issue in reporting dangers to navigation. The hydrographer should ensure that the discovery of a potential danger to navigation is reported immediately to the appropriate authority. Further, should additional dangers be discovered during the processing of the survey, a danger report shall be immediately forwarded. See Appendix 9 for an example Danger to Navigation Report.

A danger to navigation is considered to be any natural feature (e.g., shoal, boulder, reef, rock outcropping) as well as any cultural feature (e.g., wreck, obstruction, pile, wellhead) which, during the course of survey operations was found by the hydrographer to be inadequately charted. Potential dangers shall be evaluated in the context of the largest scale nautical chart of the area. Unless specified otherwise in the Hydrographic Survey Letter Instructions or Statement of Work, all submerged features with depths of 11 fathoms (66 feet) or less in navigable waters should be considered potential dangers to navigation and subject to reporting. During the course of reviewing survey data for potential dangers to navigation, the hydrographer should be aware of the types of vessels transiting the area along with usual and seasonal vessel routes throughout the survey area.

Danger to Navigation Reports are required for:

- Significant uncharted rocks, shoals, wrecks, and obstructions
- Depths from the present survey which are found to be significantly shoaler than charted depths and features
- Uncharted or inadequately charted clearances for bridges and overhead cables or pipelines
- Floating wreckage, logs, derelicts, or other similar objects that are menaces to navigation
 - A fixed or floating aid to navigation found to be off station to an extent that the aid does not serve its purpose adequately
- A fixed or floating aid showing significantly different characteristics than those charted or described in the Light List
- Other submerged or visible features, or conditions considered dangerous to navigation

Once all dangers to navigation (DTON) are identified by using the criteria above, they must be reviewed in context with the largest scale chart covering the survey area. DTONs submitted to the processing should not

cause undue clutter in relation to other soundings or features on the chart. When multiple distinct features are located within 3mm of each other, as depicted on the largest scale chart of the area, then the most significant DTON located within the 3mm radius shall be submitted as a single danger to navigation.

In cases where dangers are too complex to be adequately identified as discrete features, they should be appropriately depicted on the chartlet which accompanies the danger letter. For example, widespread shoaling would be represented as a series of depths with appropriate depth curves instead of listing individual soundings and geographic positions.

Include a copy of the Danger to Navigation Report in Appendix I of the Descriptive Report.

8.1.3. Descriptive Report

A Descriptive Report is required for each hydrographic survey sheet completed, unless specified otherwise in the Letter Instructions or Statement of Work. The Descriptive Report is submitted to the Atlantic or Pacific Hydrographic Branch along with the preliminary smooth sheet and other supplemental reports and survey records, after field-data acquisition and processing of the survey has been completed.

The primary purposes of a Descriptive Report are to: 1) help cartographers process and evaluate the survey; 2) assist the compilers producing or revising charts; 3) document various specifications and attributes related to the survey and its by-products (e.g., preliminary smooth sheet); and 4) provides a legal description of the survey standards, methods, and results. The cartographers will have no knowledge of the particulars of a survey, other than what is documented in the Hydrographic Survey Letter Instructions or Statement of Work, digital survey data, Descriptive Report, and supplemental reports referenced in the Descriptive Report. The Descriptive Report is archived as a historical and legal record for the survey.

The Descriptive Report supplements hydrographic sheets and sounding records with information that cannot be depicted or described in the digital data, or shown clearly in graphic form. The Descriptive Report describes the conditions under which the survey was performed, discusses important factors affecting the survey's adequacy and accuracy, and focuses upon the results of the survey. It contains required information on certain standard subjects in concise form, and serves to index all other applicable records and reports.

General statements and detailed tabulations of graphically evident data, such as inshore rocks, shoals, or coral heads already shown on the preliminary smooth sheet, should not be included in the Descriptive Report. Hydrographic characteristics of the survey area such as nearshore features, shoreline, currents, water levels, and changes to the chart that are otherwise not clearly defined by the graphic or digital products should be completely described in the Descriptive Report.

The following information is required in each Descriptive Report in the order listed below:

COVER SHEET (NOAA Form 76-35A, see Appendix 3) Appropriate entries are made to identify the survey. For each survey, the Registry Number, Sublocality, General Locality, and State will be provided in the Hydrographic Survey Letter Instructions or Statement of Work.

TITLE SHEET (NOAA Form 77-28, see Appendix 4). The "Hydrographic Title Sheet" is often referred to for information pertaining to the survey. The "State", "General locality", and "Locality" entries are to be identical to those on the Cover Sheet. The "Date of survey" entries are the inclusive dates of the fieldwork. For "Vessel", enter the name and hull number of the surveying vessel. The name(s) listed after "Surveyed by" are the personnel who supervised sounding operations and/or data processing.

The “Remarks” section should contain any additional information, including the purpose of the survey and survey area information, that will identify the project or clarify the entries above. Other Descriptive Reports or special reports containing information or data pertinent to the survey that are not listed in Section E of the Descriptive Report text should be referenced here. Note the time zone used during data acquisition (e.g., All times are recorded in UTC). If applicable, list the name and address of the contractor and any subcontractors.

DESCRIPTIVE REPORT TEXT. Print the text on one-sided 8.5 by 11-inch paper with left-hand margins of 1.25 inches to permit binding. Do not use oversized sheets. Text shall be Times New Roman with a font size of 12. Include all information required for complete understanding of the field records. When referring to a hydrographic feature on the preliminary smooth sheet, give the latitude, longitude and datum of the feature. Discussions and explanations should be written in a clear and concise manner- Avoid verbosity.

Provide the following information in the form of a title on the first page of the text: Descriptive Report to Accompany Hydrographic Survey H _____ (registry number), scale and year of the survey, name of survey vessel(s) or party, and the chief of party (or lead hydrographer). On each subsequent page, include registry number and field unit as a header. Pages shall be numbered consecutively from the first page of text, continuing through the Approval Sheet (page numbers as a footer, centered on page). Include a Table of Contents with page numbers.

Avoid using geographic names in the text of the Descriptive Report that do not appear on the preliminary smooth sheet.

To provide uniformity of reports for future reference, arrange the text under the following lettered headings in the order appearing here.

A. AREA SURVEYED

Include a coverage graphic (black and white or grey scale) inclusive of the survey area. The information related to the present survey should be clearly shown and highlighted in some way to draw attention to its location within the project area. The survey area should be further divided to differentiate the major sounding systems, such as single beam echosounder, Multibeam sonar, or side scan sonar. These graphics may be imbedded in the sketch or included on separate sheets. If separate sheets are needed, include these in Appendix V, Supplemental Survey Records and Correspondence.

B. DATA ACQUISITION AND PROCESSING

BI. Equipment

In this section of the Descriptive Report list by manufacturer and model number only the major systems used to acquire survey data or control survey operations (e.g., single beam sonar, Multibeam sonar, side scan sonar, vessel attitude system, positioning system, sound velocity system). Include a brief description of the vessel (e.g., length overall and draft). A detailed description of the systems used to acquire survey data or control operations shall be included in the project-wide **Data Acquisition and Processing Report**. See Section 8.1.4 for additional information.

Include in a narrative description, with figures when useful, of any deviations from the vessel or equipment configurations described in the **Data Acquisition and Processing Report**.

B2. Quality Control

Discuss the internal consistency and integrity of the survey data. State the percentage of crossline miles as compared to main scheme miles. Evaluate their general agreement, in accordance with the Hydrographic Survey Letter Instructions or Statement of Work. If the magnitude of the discrepancy varies widely over the sheet, make a quantitative evaluation of the disagreements by area. Explain the methods used to reconcile significant differences at crossings, and give possible reasons for crossline discrepancies that could not be reconciled.

Discuss the methods used to minimize the errors associated with depth determination (see Section 54.5). Include an imbedded diagram or plot depicting the preliminary smooth sheet histogram along with an analysis of the results (see Section 8.2.2)

Evaluate survey junctions in this section. Junctions are made between adjoining contemporary surveys to ensure completeness and relative agreement of depths. List, by registry number, scale, date, and relative location, each survey with which junctions were made. Include a summary of each junction analysis. Explain methods used to reconcile significant differences at junctions, and give possible reasons for junction discrepancies that could not be reconciled. Include recommendations for adjustments to soundings, features, and depth curves, if applicable.

Discuss Multibeam quality control checks as required by the Hydrographic Survey Letter Instructions or Statement of Work.

Discuss any unusual conditions encountered during the present survey which would downgrade or otherwise affect the equipment operational effectiveness. Discuss any deficiencies that would affect the accuracy or quality of sounding data. Document these conditions, including how and when they were resolved.

Describe any other factors that affected corrections to soundings,, such as sea state effects, the effect of sea grass or kelp, and unusual turbidity, salinity, or thermal layering in the water column.

83. Corrections to Echo Soundings

Discuss any deviations from those described in the **Correction to Echo Soundings** section of the **Data Acquisition and Processing Report**.

C. VERTICAL AND HORIZONTAL CONTROL

Include in this section of the Descriptive Report a summary of the methods used to determine, evaluate, and apply tide or water level corrections to echo soundings on this survey.

State the horizontal datum and projection used for this survey. Briefly discuss the control stations used during this specific survey. If USCG DGPS stations are used, only list the station name in this section. Explain in detail any difficulties that may have degraded the expected position accuracy.

See Section 8.1.4 for additional information to be provided in the project **Vertical and Horizontal Control Report**.

D. RESULTS AND RECOMMENDATIONS

D.1 Chart Comparison

Compare the survey with all charts listed in the Hydrographic Survey Letter Instructions or Statement of Work. Identify the chart by number, edition number, and edition date. In addition, Notices to Mariners affecting the survey area which were issued subsequent to the date of the Hydrographic Survey Letter Instructions or Statement of Work and before the end of the survey must be specifically addressed. Identify the last Weekly and Local Notices to Mariners compared to during the survey by notice number and date. Any Notice that prompts a chart comparison item must be identified by its Notice to Mariners number and date.

Comment on the degree of general agreement with charted soundings. Discuss general trends, such as shoaling or deepening occurring in the survey area. List significant charted depths that have been disproved.

Make a comparison between the survey data and all charted shoals and potentially hazardous features. Describe the methods of investigation and include least depths. List charted features not found during the present survey.

List and discuss comparisons of survey depths with controlling depths, tabulated depths, and reported depths of all maintained channels. Also discuss soundings in designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas and along channel lines and range lines.

Briefly describe assigned Automated Wreck and Obstruction Information System (AWOIS) items investigated by singlebeam or Multibeam echosounder, side scan sonar, divers, and/or other methods in this section. Complete the AWOIS database record with field investigation results and include a copy of the record here along with a copy of any graphic correlation output. These reports should include a detailed description of the item investigation, an analysis of any differences between past and present survey findings, and a charting recommendation. Also, include any official salvage documentation that would expunge the feature from the chart without having to further investigate with a survey platform.

Any charted features that contain the label PA, ED, PD, or Rep (see Chart No. 1 for definitions.), not specifically assigned as an AWOIS item and investigated in this survey, should be documented and discussed in this section. The source of the charted feature should be listed if known. Also, discuss features such as wrecks and obstructions from miscellaneous sources. Describe the condition and distinguishing characteristics of all items mentioned.

Refer to any Danger to Navigation Reports submitted for this survey. A negative statement is required if no Danger to Navigation Reports were submitted.

D.2 Additional Results

If specified in the Hydrographic Survey Letter Instructions or Statement of Work, describe and discuss the shoreline investigation results.

If applicable, briefly discuss prior survey comparisons conducted by the hydrographer. In general, prior survey comparisons are not required by field personnel, but may be used at the discretion of the hydrographer for quality control purposes.

Discuss aids to navigation which do not serve their intended purpose, are damaged, or whose characteristics do not match the chart or Light List (see Section 7.2). A statement shall be made in this section of the Descriptive Report if all aids serve their intended purpose.

List all bridges, overhead cables, and overhead pipelines. State the status or condition of each feature. Provide applicable clearances determined by the survey party or by an authoritative source (e.g., the U.S. Coast Guard or U.S. Army Corps of Engineers). Include the geographic coordinates directly below the minimum clearance point. All such charted overhead features that no longer exist must also be listed. Include written documentation, if available, and photographs with the survey records. Invalid or uncharted overhead clearance information, or ongoing construction of bridges or overhead cables and pipelines, constituting a potential danger to navigation, should be reported to the U.S. Coast Guard and the U.S. Army Corps of Engineers.

Mention any submarine cables and pipelines and any associated crossing signs on the shoreline. Include coordinates for signage or the water entry point of the feature. Note ferry routes and list position of each ferry terminal, if not shown on the chart or contemporary NOS remote sensing maps.

For each drilling structure, production platform, and well head within the survey area (excluding temporary jack up rigs), make a comparison between the new survey position and the largest scale chart on which the feature is shown and discuss any differences.

Provide information of significant scientific or practical value resulting from the survey. Unusual submarine features such as abnormally large sand waves, shifting or migrating shoals, mounds, valleys, and escarpments should be described. Discuss anomalous tidal conditions encountered, such as the presence of swift currents not previously reported. Discuss any environmental conditions encountered, which have a direct bearing on the quality and accuracy of the hydrographic data. If special reports have been submitted on such subjects, refer to them by title, author, and date of preparation or publication.

Mention present or planned construction or dredging in the survey area that may affect the survey results or nautical charts. Recommend new surveys for any adjacent areas that need them. As appropriate, include recommendations for further investigations of unusual features or sea conditions of interest that go beyond routine charting requirements. Recommend insets to be shown on the published chart of the area, if requested by chart users or needed for clarity.

E. APPROVAL SHEET

The Chief of Party or Lead Hydrographer shall furnish, on a separate sheet, a signed statement of approval for the survey and all related records. The approval sheet shall contain the following:

- Approval of preliminary smooth sheet (signed and dated), Descriptive Report, digital data, and all accompanying records. This approval constitutes the assumption of responsibility for the stated accuracy and completeness of the hydrographic survey.
- A statement as to whether the survey is complete and adequate for its intended purpose or if additional work is required.
- The amount and degree of personal supervision of the work.
- Additional information or references helpful for verifying and evaluating the survey.
- List all reports and data not included with the survey records or Descriptive Report that have been submitted to the processing office or to another office (e.g., Data Acquisition and Processing Report, Vertical and Horizontal Report, Tides and Water Levels Package, Coast Pilot Report). Include date of the report or date of submission.

If appropriate, other personnel responsible for overseeing or directing operations on this survey sheet may also sign the Approval Sheet.

DESCRIPTIVE REPORT APPENDICES

The Appendices shall be inserted in the following order after the Descriptive Report Approval Sheet.

I. DANGER TO NAVIGATION REPORTS

Include copies of Danger to Navigation Reports and correspondence. List each document by some type of unique identifier, such as date for a letter or e-mail.

II. LIST OF GEOGRAPHIC NAMES

The hydrographer shall investigate the geographic names that occur within the limits of the survey area. If corrections or new names are discovered, a list of these geographic names shall be prepared and included in this appendix with substantiating information about the source of the new information. The previously required NOAA Form 76-155, "Geographic Names", which indicates all names appearing on the smooth sheet will be prepared by the appropriate processing center.

III. PROGRESS SKETCH

Include a copy of the final Progress Sketch (black and white or grey scale). See Section 8.1.1 for Progress Sketch requirements.

IV. TIDES AND WATER LEVELS

Include the following (if applicable):

- Field Tide Note
- Final Tide Note
- Abstract of Times of Hydrography (lists every day during which hydrography was conducted and the times between which hydrography was conducted during each day)
- A copy of the "Request for Approved Tides/Water Levels" letter
- Any other correspondence directly relating to tides and/or water levels

V. SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE

Include any additional survey records not previously addressed in the Descriptive Report, Appendices or Separates (e.g., MapInfo tables). Any letter or email correspondence relating to the present survey should also be included.

SEPARATES TO BE INCLUDED WITH THE SURVEY DATA

The following “**SEPARATES TO BE INCLUDED WITH THE SURVEY DATA**” supplementing the Descriptive Report shall be submitted with each survey. The Separates shall be bound, organized and clearly labeled.

I. ACQUISITION AND PROCESSING LOGS

Include all acquisition and processing logs from the present survey.

II. SIDE SCAN CONTACT LISTING AND IMAGES OF SIGNIFICANT CONTACTS

Include the side scan contact listing, along with hard copy images of all significant contacts.

III. SOUND VELOCITY PROFILE DATA

Include a table, which identifies the specific sound velocity profiles used during the present survey. List the positions and dates of all casts used; the maximum cast depth; and the dates/times for which the profiles were applied. Refer to the location where the digital sound velocity files are located, and include a directory listing of the files. If appropriate, describe how the survey area was zoned to account for sound velocity variations from differing water masses. Printouts of individual sound velocity profiles are not required.

Include confidence check results and copies of sound velocity profiler calibration report(s).

Include a black and white or grey scale graphic depicting locations of sound velocity casts relative to the survey area.

IV. HYDROGRAPHIC SURVEY LETTER INSTRUCTIONS/STATEMENT OF WORK

Include copies of the Hydrographic Survey Letter Instructions or Statement of Work. Include all changes/modifications which apply to the present survey.

V. CROSSLINE COMPARISONS

Include the summary plot analysis as a function of beam number for the mainscheme/crossline intersections as required in Section 5.53. Include any other crossline quality reports required by the Hydrographic Survey Letter Instructions or Statement of Work.

8.1.4. Descriptive Report Supplemental Reports

8.1.4.1. Data Acquisition and Processing Report

The Data Acquisition and Processing Report is a project-wide report that shall be submitted before, or not later than, the submission of the first survey of the project. The **Data Acquisition and Processing Report** shall be sent to the Chief, Data Acquisition and Control Branch and the appropriate processing branch specified in the Hydrographic Survey Letter Instructions or Statement of Work. This report is separated into three sections, **Equipment, Quality Control, and Corrections to Echo Soundings**. These sections shall contain a detailed discussion on the project specific information addressed below.

Include a cover sheet and title sheet which contain the following general information:

Cover Sheet. Include the type of survey(s), state, general locality and year. (Appendix 10)

Title Sheet. This contains additional descriptive information relative to the project. Include project number, date of Hydrographic Survey Letter Instructions/Statement of Work, vessel(s), field unit/contractor, sub-contractors, and Chief of Party/Lead Hydrographer.

A. Equipment

Describe the major operational systems used to acquire survey data or control survey operations. Include the manufacturer, firmware version and model number, operational settings and how the equipment was used. Include a description of the vessel(s) used.

Specifically discuss singlebeam, Multibeam and side scan sonar systems and operations in this section. Include range scales, ping rate, number of beams, depth of water, line orientation and spacing, swath width, resolution, alongtrack coverage, and quality assurance tools used during data acquisition.

Discuss the computer hardware and software used for all data acquisition and processing. Describe acquisition and processing methods, procedures, and parameters used. Provide a complete list of all software versions and dates.

B. Quality Control

Provide a description of the data processing routines for converting raw sounding data to the final smooth sounding values. Include a description of the methodology used to maintain data integrity, from raw sounding data to final soundings. Processing flow diagrams are helpful. Any methods used to derive final depths such as cleaning filters, sounding suppression/data decimation parameters, binning parameters, and excessing algorithms shall be fully documented and described in this section.

Methods and standards used to examine side scan sonar records should be noted and a brief description of processing procedures should be provided. Include the methods for establishing proof of swath coverage and the criteria for selecting contacts.

C. Corrections to Echo Soundings

This section addresses the methods used for the determination of all corrections to echo soundings that apply to the entire project. Describe the methods used to determine, evaluate, and apply the following corrections to echo soundings:

- Instrument corrections.
- All vessel configuration parameters, offsets, layback, etc include diagrams, pictures, or figures of the equipment as installed onboard.
- Static and dynamic draft measurements.
- Heave, roll, pitch biases, and navigation timing errors. State the manufacturer, model, accuracy, and resolution of heave, roll, and pitch sensor(s). Discuss accuracy and alignment test procedures and results. Include copies of system alignment, accuracy, and calibration reports.

- Discuss the source of tide or water level correctors used for data processing and final sounding reduction

If applicable, explain the calibration or determination of correctors for any secondary depth determining systems that are used during this project, e.g., leadlines, diver-deployed depth gauges, etc. Include the date(s) of most recent calibration(s). State whether or not checks were made on their accuracy, and describe any nonstandard procedures used.

D. Approval Sheet

The Chief of Party or Lead Hydrographer shall furnish, on a separate sheet, a signed statement of approval for all information contained within the **Data Acquisition and Processing Report**.

If appropriate, other personnel responsible for overseeing or directing operations on this project report may also sign the Approval Sheet.

8.1.4.2. Vertical and Horizontal Control Report

The **Vertical and Horizontal Control Report** is a project-wide report which shall be submitted before, or not later than the submission of the last survey in project area.

Include a cover sheet and title sheet which contain the following general information:

Cover Sheet. Include the type of survey(s), state, general locality and year.

Title Sheet. This contains additional descriptive information relative to the project. Include project number, survey registry numbers to which this report applies (with associated dates of survey and locality), date of Hydrographic Survey Letter Instructions/Statement of Work, vessel(s), field unit/contractor, sub-contractors, and Chief of Party/Lead Hydrographer.

A. Vertical Control

The **Vertical Control** section of the project **Vertical and Horizontal Control Report** shall document all Tide and Water Level activities that took place as part of this project. Specific information pertaining to an individual survey sheet and the Request for Approved Tides letter shall be documented in the Descriptive Report for the individual survey. This section shall contain a discussion

- All stations established by the field unit (include gauge model/type). Give station number, latitude/longitude, and the dates/times of operation.
- The method by which correctors for the field data were obtained and applied.
- The time meridian used to annotate the tide records.
- A list of any unusual tidal, water level, or current conditions.
- The height and time corrections, and zoning if different from that specified in the Hydrographic Survey Letter Instructions or Statement of Work.

B. Horizontal Control

The **Horizontal Control** section of the project **Vertical and Horizontal Control Report** shall document Hydrographic Position Control activities that took place as part of this project. Specific information pertaining to an individual survey sheet shall be documented in the Descriptive Report for the individual survey.

For horizontal control stations established by the field unit, describe the survey methods used to establish the station, and state the standards of accuracy used. Include position accuracy plots (see Section 3.2.2).

For all horizontal control stations established by the field unit, list:

- The latitude to the nearest 1/1,000th of a second.
- The longitude to the nearest 1/1,000th of a second.
- The station elevation (ellipsoidal height).
- The geodetic station name and year it was established.

Briefly, describe the methods and adequacy of positioning system confidence checks.

C. Approval Sheet

The Chief of Party or Lead Hydrographer shall furnish, on a separate sheet, a signed statement of approval for all information contained within the **Vertical and Horizontal Control Report**.

If appropriate, other personnel responsible for overseeing or directing operations on this project report may also sign the Approval Sheet.

8.2. Preliminary Smooth Sheet

The preliminary smooth sheet is the final, legible, accurate plot of a hydrographic survey. In contrast to the field sheet plotted during field operations from preliminary field data, the preliminary smooth sheet is plotted from corrected data. The preliminary smooth sheet and survey information shown thereon shall conform to the cartographic standards and conventions described in this section. The preliminary smooth sheet shall contain only data that meet the accuracy standards in Section 5.2. Gridded or averaged Multibeam soundings shall not be displayed on the preliminary smooth sheet; only actual, corrected soundings. The scale of the preliminary smooth sheet will be specified in the Hydrographic Survey Letter Instructions or Statement of Work.

Following NOS inspection and administrative approval, a preliminary smooth sheet becomes the official smooth sheet, which is the permanent graphic record of a survey and is the principal authority for hydrographic data to be charted. Smooth sheets are referred to frequently during chart compilation. In addition, copies are often furnished to surveyors, engineers, geologists, lawyers (for use in the courts), and others with interests in marine surveys.

8.2.1. Specifications

Sheet Material

Preliminary smooth sheets and overlays shall be plotted only on stable polyester film 4.0-mils thick, semitransparent, and matte finished on both sides.

Sheet Size and Layout

Preliminary smooth sheet sizes shall not exceed 91.5 by 137.2 cm (36 by 54 inches). Overlays should be the same size as the preliminary smooth sheet they accompany. Preliminary smooth sheet limits should conform closely to those shown on the approved sheet layout with respect to area coverage, orientation, and size. The consolidation of separate survey areas onto a single preliminary smooth sheet shall be done using MicroStation reference files. The original coordinates of the surveyed data shall not be changed in the design file to accomplish single sheet plotting.

Plot preliminary smooth sheets at the scale of survey specified in the Hydrographic Survey Letter Instructions or Statement of Work. Plotter sheets shall have a plotter registration accuracy which does not exceed 3 mm in the longest dimension of the survey sheet.

Drafting Standards

Approved preliminary smooth sheets are official Government documents retained permanently in the National Ocean Service archives. Standards of accuracy for smooth plotting and detailing must reflect the high standards of accuracy of the collected data. Specifications are listed below.

Lettering Fonts

Lettering shall employ the MicroStation 224 (txt) or 1 (working) font.

Lettering Orientation

Symbols and lettering shall be aligned with parallels of latitude so they can be read from the south to the extent practical. Where geographic names cannot be lettered in an east-west direction, they shall be aligned at an angle or along a curve so they can be read from the south.

Regardless of the direction of the sounding line, sounding numerals shall be oriented as consistently as possible, and individually rotated about their insertion points to be easily readable from the south. Where soundings are spaced very closely, two- and three-digit soundings may be rotated at an angle to avoid congestion.

Both vertical and slant-style lettering are used on preliminary smooth sheets. Vertical characters shall be used for:

- Names and descriptions of topographic features that, in general, include all features above mean high water.
- Control station names and numbers.
- Projection line labels.
- Title-block information.

Slant-style characters shall be on a 15° to 25 ° slant and shall be used for:

- Names of hydrographic features; in general, all features below mean high water, and related descriptive notes.
- Elevations of bare rocks, rocks awash piling, and other similar objects.
- Official names and designations of all aids to navigation.
- Bottom characteristics

If a control station symbol will obscure an offshore feature on the preliminary smooth sheet, describe the feature on which the station is located. Ensure that the feature is plotted on the preliminary smooth sheet.

Lettering Placement

For annotations, lettering shall be placed on preliminary smooth sheets in such a manner that there can be no doubt as to the item or feature it describes. Control station names and related descriptive information shall be placed in the land areas, if possible, to ensure optimal clarity of hydrographic detail. Where practical, annotations should be separated from symbols by the space of approximately one letter, and be either on line with the symbol or placed as a subscript. Where the placement of a note could create doubt regarding its reference, a simple leader with arrow terminator shall be used. Extensive use of offset names, descriptions, and designations is undesirable.

Level/Layer Scheme

Digital data shall be separated onto different levels/layers as follows:

<u>Name</u>	<u>Content</u>
Projection	Geographic projection graticule lines and labels
Title	Title block and related notations
Geographic names	Geographic names
soundings	soundings
Contours	Depth curves
Shoreline	Shoreline and attached cultural features or other entity visible at mean high water
Trackline	Vessel tracklines
Position Number	Position fix numbers
Features	Non-sounding features, e.g., wrecks, obstructions, bottom samples descriptions
Misc.	Miscellaneous information

The naming of a level/layer does not necessarily imply that information of that type will be present in the drawing.

Line Style

All Line work shall employ a line weight of zero and shall be a continuous style unless clearly documented in a key placed on the drawing. Custom linestyle or patterns are acceptable, however, all resource files, libraries etc. must accompany the digital survey data and be identified in the Data Acquisition and Processing Report list of software used. The use of splined lines shall be avoided. Polyines shall be used whenever possible.

Colors

With the exception of depth curves the preliminary smooth sheet shall be compiled using black color. The color table shall be the standard default table accompanying the CAD software.

Pen Tables

Plotter pen tables shall not be used to alter the appearance of the drawing.

Abbreviations

Abbreviations are acceptable but must be identified in a table placed on the drawing. Do not identify bottom characteristic abbreviations on the drawing.

Scale/Working Units

The preliminary smooth sheet shall be compiled in real-world units then plotted at the survey scale specified in Hydrographic Survey Letter Instructions or Statement of Work. The Working Units in MicroStation shall be Master Units in meters; Sub-Units in decimeters. The Resolution shall be set to 10 pu (position unit) per su (sub unit).

Blocks/Cells

Only those cells supplied by NOS shall be used in the preliminary smooth sheet drawings.

Prototypes/Seed Files

Prototype drawing files or customized seed files shall be delivered with the preliminary smooth sheets. If no customization was completed, then the records should specify the nature of the prototype/seed file in use. Use only 3D seed files.

Archiving

Finished drawings shall be saved as MicroStation design files (.dgn) that are loadable into MicroStation 95 version 5.05. MicroStation files shall be saved using the ARCHIVE function which will attach all related resource files. *Precautionary note: A shift in positions of soundings has been noted when converting from AutoCad to MicroStation files. The hydrographer shall ensure that sounding positions within the MicroStation design file match original sounding positions.*

8.2.2. Cartographic Specifications and Conventions**Projection**

The Universal Transverse Mercator projection shall be used. NAD 83 latitude and longitude lines shall be shown by continuous lines fine enough so that soundings will not be obscured. Labels for meridians and parallels shall be in degrees, minutes, and seconds and are placed in the sheet margins beyond the limits of hydrography.

Soundings

Soundings and related hydrographic detail needed to compile nautical charts are important observations of a hydrographic survey. It is essential that the final corrected soundings plotted on the preliminary smooth sheet

be accurately and graphically displayed in a uniform manner. The soundings shall be actual corrected soundings. Gridding, averaging, or other sounding manipulation shall not be conducted.

Sounding numerals shall be between **1.8** (preferred) and 2.0 mm high and uniform across the preliminary smooth sheet. At this size, legible reproductions can be made at reduced scales. The center of the sounding numeral or group of numerals is the position of the sounding.

Sounding Units and Conversion

All soundings on the preliminary smooth sheet shall be plotted in units specified in the Hydrographic Survey Letter Instructions or Statement of Work. The following conversion factors shall be used:

- To convert sounding from meters to feet, 3.28084 ft/m.
- To convert soundings from meters to fathoms, 0.546807 fm/m.

When rounding corrected and converted soundings, regardless of units (meters, feet, or fathoms), the following procedures shall apply:

- When rounding to whole numbers, any depths less than X.750000 should be rounded to the shoaler number X, and any depth greater than or equal to X.750000 should be rounded to the deeper depth. For example, **35.75** becomes 36 and 35.74 becomes 35.
- When rounding to tenths, any depths less than X.Y75000 becomes X.Y, and any depth greater than or equal to X.Y75000 becomes X.(Y+1). For example, 35.574 becomes 35.5 and 35.575 becomes 35.6.

Spacing of Plotted Soundings

The spacing and density of soundings on preliminary smooth sheets shall be such that each depth curve is delineated adequately and the configuration of the bottom is fully revealed. Preliminary smooth sheet soundings are generally spaced uniformly at 4-7 millimeters apart. No portion of any sounding shall be within 2 millimeters of any other sounding at plotted scale. Soundings shall be clearly legible, and not plotted over adjacent soundings.

Where the bottom is irregular, the spacing of soundings will also be irregular. Soundings must be shown at abrupt changes in the bottom slope and over peaks and deeps that characterize the bottom as irregular, undulating, dredged, or channeled.

Multiple-digit soundings for single-beam surveys should be shown at an angle to sounding lines when necessary to portray the bottom configuration adequately. In many cases, angled soundings provide an attractive alternative to plotting a preliminary smooth sheet at a scale larger than planned or to “excessing” an inordinate number of soundings because of overlapping numerals.

Selection of Soundings and Excessing

Soundings must be selected from valid filtered soundings from the hydrographic records to plot on preliminary smooth sheets using a shoal-biased selection routine. It cannot be overemphasized that the proper selection of soundings is essential for a complete and accurate portrayal of the bottom configuration.

With a Multibeam system, a relatively high percentage of preliminary smooth sheet soundings originating from only a few beams may indicate the presence of systematic or system specific errors in the acquisition or

processing systems. The hydrographer shall construct a histogram showing the count, by beam number, of the selected soundings. The histogram and the hydrographer's analysis of the results shall be included in Section B of the Descriptive Report. If necessary, the data shall be re-processed and the preliminary smooth sheet redrawn using the newly selected soundings.

Realistically, every irregularity cannot be represented at the scale of the preliminary smooth sheet. Minor relief and insignificant features in very irregular bottom generally must be disregarded. That significant peaks and deeps be shown is, however, essential. Soundings to be inserted at uneven intervals must not be shown in small distorted numerals or those that run together and fail to identify individual soundings.

When routine sounding lines overlap or cross, the shoaler soundings shall be plotted. If the difference is significant, then the data must be analyzed to determine the cause of the difference.

The selected data set shall be tagged (MicroStation) in a manner such that the selected data can be re-traced to the Multibeam or single beam data set. The attribute or tag shall include, but is not limited to, XY (latitude, longitude, NAD83), Z (depth in meters), year, day number, and time.

Hydrographic Features

Appendix 2, NOS Cartographic Codes and Symbols, contains the conventional symbols to be used on preliminary smooth sheets to depict the hydrographic features discussed in the following sections.

Submerged Obstructions

All submerged obstructions found during a hydrographic survey shall be shown on the preliminary smooth sheet using the appropriate symbol.

Obstructions are designated as submerged or sunken if their least depths are greater than or equal to **0.8 m below the sounding datum**. If least depths could not be determined over unnatural features such as stubs or piles, ruins of piers and other structures, and wreckage of various kinds, the feature is shown by a 1-mm circle or by a dashed outline with appropriate annotation.

If the nature of an obstruction was not determined, the note "obstn" shall be used. Dashed lines are used to indicate an extension below the high water datum of marine railways, groins, breakwaters, sewer outfalls, or other unnatural features rising above the bottom. All annotations shall be in slanted lettering.

Visible Obstructions

In water areas, visible obstructions such as wrecks, piles, breakwaters, groins, fences, duck blinds, and fish houses are plotted on preliminary smooth sheets. Obstructions are considered **visible if their elevations are 0.7 m or greater above MHW in tidal waters**. Such obstructions are depicted by their distinctive symbols or, if necessary, by outlining the area of obstructions with dashed lines. Annotations are to be in vertical lettering for features rising above the shoreline datum for the area; otherwise, use slanted lettering.

Wrecks

Stranded wrecks should be depicted such that the small circle of the wreck symbol is the actual position of the wreck. Large hulks should be outlined and labeled accordingly, if the scale of the survey permits.

Sunken wrecks are covered at low water, but the masts may uncover. In such cases, the notation "masts" accompanies the sunken wreck symbol. When a least depth over a sunken wreck has been accurately

determined and is greater than 0.2 m below the sounding datum, the depth with the notation “wreck” or “Wk” is shown instead of using a wreck symbol.

Rocks

Rocks are naturally occurring features either fixed to the seafloor in the form of bedrock or detached in the form of boulders, erratics, rubble, etc. Cartographic depiction of these features takes into account several conditions such as depth, elevation, and proximity of scattered rocks.

The elevation or depth of a rock determines if it is classified in one of the following zones: submerged, awash (covers/uncovers) and bare. The specific depth/elevation values that bound these zones are graphically depicted in Appendix 2.

The density of observed rocks determines the actual number and type of cartographic symbols used to depict the condition on the preliminary smooth sheet. The area required to depict a rock that covers/uncovers is approximately 1.8mm at the scale of the preliminary smooth sheet. Therefore, if similar rocks are clustered such that they are closer than 1.8mm apart, special provisions must be employed to ensure the most significant information is depicted. In these cases, an alternate form of depicting rocks in proximity to one another is to employ either a ledge or reef symbol, Cartographic Code 530, as appropriate. Another option is to reduce the number of symbolized rocks, depicting only those most significant. Significance is determined based on height and distance seaward from the shoreline or center of the rock cluster in the case of isolated offshore locations. The significance of rocks with heights above the sounding datum is directly proportional to their height. Conversely, the significance of submerged rocks is directly proportional to their depth. Rocks most distant from shore or the center of the rock cluster are also most significant. Areas containing numerous rocks may be considered foul. In such cases, only those rocks defining the seaward extent of the foul area should be located. The area should be bounded by a dashed line, Cartographic Code 894. Appropriate notation should be added to describe the condition, e.g., Cartographic Code 538, foul.

Depth Curves

Depth curves (isobaths or lines of equal depth) are comparable to topographic contours on land. Principles governing the portrayal of topographic contours are equally applicable when drawing depth curves, except that depth curves generally are drawn to include soundings equal to and less than the curve value. Depth curves are indispensable for a comprehensive interpretation and examination of a hydrographic survey. The best gauge of the survey’s completeness, adequacy, and accuracy is to be able to draw closely spaced depth curves with an assurance that the submarine relief is depicted accurately.

For the purposes of nautical chart compilation, depth curves shall be drawn based on soundings selected using the shoal-biased selection routine noted above. Standard depth curve intervals and colors required on survey preliminary smooth sheets are specified in Appendix 8. The standard depth curves shall be plotted in the prescribed colors. Supplemental depth curves shall be added where necessary and shall be drafted in brown ink.

Depth curves are broken into long dashes where not adequately defined by the soundings (e.g., extremely flat monotonous bottoms where the plotted soundings defy the drawing of a meaningful curve).

Aids to Navigation

All aids to navigation located within the survey limits shall be shown on the preliminary smooth sheet, indicated by the appropriate symbol in the proper color.

Geographic Names

As many as possible of the charted named hydrographic features within the area of hydrography shall be shown on the preliminary smooth sheet. These features include, but are not limited to, bays, harbors, channels, sloughs, rivers, inlets, reefs, rocks, shoals, and some offshore topographic features such as small bare rocks and islets. All geographic names shall be in uppercase letters.

Geographic names shall not obscure or otherwise confuse plotted soundings and related hydrographic data.

Title Block

The information to be entered in the title block (Figure 8.2.1) of a hydrographic preliminary smooth sheet is extracted from the Title Sheet in the Descriptive Report. Title blocks shall be oriented with their base parallel to the sheet edge. Approximate dimensions for the title block are a height of 15 cm and a width of 20 cm. The hydrographer shall sign the preliminary smooth sheet in the title block.

Survey data or notes shall not, under any circumstances, be shown inside the title block. On most inshore surveys, there is adequate title-block space in land areas or in unsounded water areas. Offshore sheets must be laid out so there is sufficient space for the title block. No particular portion of a sheet is favored over another for the title block.

8.3. Shallow-Water Multibeam Sonar Swath Coverage Plot

If applicable, the hydrographer shall produce three swath coverage plots (no smaller than specified survey scale) for all Multibeam surveys; one plot depicting color by depth of bottom coverage (see Section 5.3.1, Demonstration of Coverage) and two plots depicting sun-illuminated images of the area ensonified (see Section 5.5.4 Multibeam Sun-Illuminated Digital Terrain Model (DTM) Images). The hydrographer shall submit one hard copy and digital image of each plot. Digital images shall be in an image format with associated geographic registration information.

FIGURE 8.2.1 Example of a Title Block.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE		
HYDROGRAPHIC SURVEY H12345 STATE: ALASKA LOCALITY: SOUTHERN ALASKA PENINSULA SUB-LOCALITY: APPROACH TO KUJULIK BAY		
FIELD SHEET NUMBER: RA-10-20-98		PROJECT: OPR-P180-RA
DATUM: HORIZONTAL: NORTH AMERICAN DATUM OF 1983 (NAD 83) SOUNDING: MEAN LOWER LOW WATER		
PROJECTION: UTM - Zone 4	CENTRAL MERIDIAN: 159°00'00"W SCALE FACTOR: 0.998888	
SCALE OF SURVEY: 1:10,000	SOUNDING UNITS: FATHOMS	
SURVEYED BY:	<Signature> FIELD UNIT or CONTRACTOR XYZ	DATE: NOV-DEC 1998 MAR-APR 1999
APPROVED:	CAPTAIN SAMUEL P. DE BOW, JR., NOAA DATE: CHIEF, HYDROGRAPHIC SURVEYS DIVISION	

8.4. Side Scan Sonar

8.4.1. Side Scan Sonar Coverage Plot

A separate sonar coverage plot for each 100 percent side scan coverage shall be produced, at a scale not less than the survey scale listed in the Hydrographic Survey Letter Instructions or Statement of Work. This provides a graphic means for documenting that the effective scanning swath from each search track sufficiently overlaps the effective scanning swath from adjacent tracks.

8.4.1.1 Side Scan Sonar Mosaic

If specified in the Hydrographic Survey Letter Instructions or Statement of Work, a separate side scan mosaic for each 100 percent coverage may be used as a graphic means for demonstrating bottom coverage. If applicable, resolution of the side scan mosaics shall be no greater than 1 meter, and the hydrographer shall submit one plot of each 100% coverage along with the associated digital file (see Section 8.5.4).

8.4.2. Side Scan Sonar Contact List and Plot

Contact List

A Sonar Contact List is required and must include the specific elements of information which the hydrographer needs to prepare the preliminary Sonar Contact Plot. The various column entries are described below, along with a brief discussion of how each is to be derived.

Column 1: Search Track Number-identifies the particular search track from which the contact was observed.

Column 2: Contact Number-uniquely identifies the contact. An example of a contact number is a number based on the date/time the contact was observed, followed by a letter indicating the port or starboard (P or S) channel. For example, if a port-side contact is observed on day 181 at 150125, the contact number will be 181/150125P. Using signed (+ or -) contact range in column 4 eliminates the need for the P or S indicator.

Column 3 : Towfish Layback-the approximate distance in meters from the positioning system antenna to the towfish Unless computed by an automated system the tow-fish may be assumed to be directly astern of the towing vessel and on the search track.

Column 4: Contact Range-the horizontal distance from the towfish track to the contact, expressed in meters. All ranges scaled from the sonagram are slant ranges for standard sonars, true ranges for image-correcting sonars. True ranges are obtained from slant-range information by geometric corrections using the Pythagorean Theorem.

Column 5: Contact Position-the preliminary position as determined by reconstruction of the vessel position, towfish layback, towfish position, port or starboard channel, and contact range at the time the contact was observed. The Contact Position shall be stated as a latitude/longitude.

Column 6: Estimate of contact height computed from range and shadow length.

Column 7: Remarks-used to denote first impressions of the contact's identity (e.g., wreck, rock, etc.), or to make any comments deemed appropriate. If, after examining the records and correlating targets from overlapping coverage, the hydrographer determines that a contact does not warrant further investigation, it shall be noted as such. A brief statement of the reasons must be made. This determination should not be made until

all numbered contacts are plotted on a preliminary Sonar Contact Plot. Any abbreviations should be defined on the list.

Column 8: Comparison with shallow water Multibeam data-used to note the corresponding shallow- water Multibeam data (day/time, line number, etc.), the results of comparing the side scan sonar data with the Multibeam data (e.g., contact did not appear in the Multibeam data, swmb least depth = x.x-sss least depth = y-y).

Column 9: Contact is depicted on preliminary smooth sheet-answered in one of three ways: (1) yes, obstr, (2) yes, sounding only or (3) no.

Once added to the list, a contact should never be removed. If, after further processing, a contact is deemed not significant by the hydrographer, it shall be labeled as such in column 7.

The contact list, and any subsequent field examination lists and records developed from the contact list, shall be included with the data submission in both hard copy and digital forms.

Contact Plot

For clarity, the Contact Plot should be plotted at the same scale as the preliminary smooth sheet. It will show the position of all significant contacts entered on the Sonar Contact List. Only significant (Section 6.3.2.) contacts, along with the views from adjacent lines, need to be plotted on the Sonar Conct Plot.

In some areas, significant contacts may be clustered (e.g., debris, boulder field). Such an area may lend itself to being depicted as a single feature: a danger curve depicting the limit with accurately positioned least depth(s) (see Chart No. 1, Nautical Chart Symbols, Abbreviations and Terms). Contacts may be grouped if they lie closer to each other than 5 mm at the scale of the survey. Only the most significant contact(s) in the group needs least depth(s) and position(s) determined.

Contact Images

For each significant contact in the contact list, the hydrographer shall provide a digital and hard copy image of the contact. Digital images shall be in a standard image format (e.g., tif, gif, jpg). Hard copies of the images shall be included in the Separates, Section II. Digital file names and hard copy labels shall coincide with the contact name as depicted on the contact list.

8.4.3. Sonargrams

If sonargrams are recorded, annotation of the sonargram while on-line is mandatory during all side scan sonar operations. All annotations shall be made in the margins of the sonargram so that no portion of the trace is unduly obscured. Time references shall be made in Coordinated Universal Time (UTC). Additional annotations may be added during processing. Note: If sonar data is supplied in digital format only, the digital data needs to be similarly annotated.

Header Annotations

Header annotations are required to identify the sonar work and for ease of later reference. Header annotations shall include:

- Registry number.
- Item number (AWOIS, if applicable).

- Day of year and calendar date.
- Towing vessel.
- Tow Point.

Header annotations shall be made:

- At the beginning of a new paper roll.
- At the beginning of each day's work. (For 24-hour operations, these annotations shall be made at the beginning of the first complete track of the new day.)
- When there is a change in the towing configuration during a day's operation.

System-Status Annotations

System-status annotations are required to describe the recorder settings and the towing situation. System-status annotations shall include:

- Mode of tuning (manual or auto).
- Range-scale setting.
- Paper-speed setting.
- Left and right channel recorder settings.
- Operator's initials.
- Length of tow-cable deployed (tow point to towfish).
- Depressor in use (yes or no).
- Weather and sea conditions.

System-status annotations shall be made:

- Prior to obtaining the first position of the day.
- Prior to obtaining the first position on a new paper roll.
- At any time the recorder has been switched off and then back on.
- While on-line, approximately every hour, regardless of any changes made.

First Position/Last Position Annotations

The following annotations shall be made at the first position on each search track:

- Line begins (LB) or line resumes (LR).

- Tow-vessel heading (degrees true or magnetic).
- Towing speed (engine rpm, and pitch if applicable).
- Index number and time (at event mark).

The following annotations shall be made at the last position on each search track:

- Line turns (LTRA, LTLA), line breaks (LBKS), or Line ends (LE) index number and time (at event mark).

Special Annotations

The occurrence of any of the following events shall be annotated on the sonargram margin at, or as soon after as possible, the time the event occurs:

- New index number (at event mark).
- Change in operator (new initials).
- Change in range-scale setting.
- Change in paper-speed setting.
- Confidence checks.
- Individual changes to recorder channel settings.
- Change in tow-cable length (tow point to towfish).
- Change in towing speed (engine rpm and pitch) or vessel heading.
- Change in tow point.
- Significant contact observed (flag using an arrow).
- Surface phenomenon observed (wakes, passing vessels, etc.).
- Passes by buoys or other known features within sonar range (identify object).
- Interference (state source if known).
- Time corresponding to the index marker.

The hydrographer shall make any other annotations necessary to note any occurrence which may later serve to reconstruct the operation. Too much information is always better than not enough.

Annotation Methods

Header and system-status annotations may be made using any of the following methods:

- Freehand on the sonargram.

- By use of a stamp.
- By use of an automatic annotator, if available.

The method is left to the hydrographer's discretion, but should be used consistently throughout the operation.

8.5. Digital Data Files

8.5.1. Media

Digital data shall be submitted on either 4 mm DDS3, 8mm AIT or DLT7000 tape, CDROM, 2 GB Jaz disk, or 3.5 inch floppy disk. All data submitted on either 4 mm DDS3, 8 mm AIT or DLT7000 tape shall be archived using the Unix tar format. The hydrographer shall include a detailed file listing of each tape, (including file size and total tape size), and specify the exact tar command used. Additionally, a detailed file Listing (including file size) shall accompany data submitted on CDROM, 2 GB Jaz disk or 3.5 inch floppy disk. Other formats may be allowed (for example, NT backup) if agreed upon in advance with the appropriate Processing Branch. The hydrographer shall work with NOS to ensure no compatibility problems exist after data submission.

8.5.2. Single-beam Data

The single-beam data format will be specified in the Hydrographic Survey Letter Instructions or Statement of Work.

8.5.3. Shallow-Water Multibeam Data

The hydrographer's Multibeam data format shall provide complete traceability for all positions, soundings, and correctors including sensor offsets, biases, dynamic attitude, sound velocity, position, sensor position, date and time, vertical datum reducers, and sounding data from acquisition through postprocessing. Data quality and edit flags must be traceable.

Raw Multibeam Data

The hydrographer shall submit raw unedited Multibeam data in a format readable by CARIS HIPS (Version 4.3, by Universal Systems Ltd.). Raw data are defined as all data acquired and logged during normal survey operations. Information and specifications on CARIS HIPS and raw data formats may be obtained from Universal Systems Ltd. At 506-458-8533.

Edited Multibeam Data

The hydrographer shall submit an edited Multibeam data set in ASCII text format. Edited data are defined as fully corrected data that meet accuracy and resolution specifications (see Section 5, Depth Sounding) are cleaned of all anomalous soundings, and serve as the source for all preliminary smooth sheet soundings and sun-illuminated DTM's (see Section 5.5.4). Edited data sets shall contain XYZ, z' (tide corrector), date/time stamp, and a unique identifier which indicates whether the sounding is depicted on the smooth sheet. Coordinates (XY) shall be latitude/ longitude NAD 83 (decimal degrees to eight decimal places), and depth (Z) shall be in meters to nearest centimeter (fully corrected for tide (MLLW datum), sound velocity, dynamic and static draft, and all vessel offsets). Tide corrector (z') shall be in meters to the nearest centimeter. Time shall be UTC to the nearest second. Data shall be binned, line by line, at a bin size not less than 5 m + 5

percent of the depth, using shoal biased filtering. All depths shall retain their survey position and shall not represent the binned area centroid or other abstract position (i.e. binned, not gridded data).

Preliminary Smooth Sheet Data

The hydrographer shall submit the preliminary smooth sheet data set in ASCII text format. The smooth sheet data set shall contain XYZ. Coordinates (XY) shall be latitude/longitude NAD83 (decimal degrees to eight decimal places), and Z shall be depth in meters to the nearest centimeter (fully corrected for tide (MLLW datum), sound velocity, dynamic and static draft, and all vessel offsets).

Specific Multibeam Data

The hydrographer shall submit raw crossline data and data used for determining navigation time latency, pitch, roll, and yaw biases on separate media. Raw mainscheme lines which contain depths over dangers to navigation, wrecks, rocks or obstructions shall also be included on separate media. The data format shall be such that CARIS HIPS can convert the data, thus making it compatible as described earlier in this Section.

8.5.4. Side Scan Sonar Data

The hydrographer shall submit digital side scan data in a format readable by CARIS SIPS (version 4.3, by Universal Systems LTD, phone: (506) 458-8533). Digital side scan sonar shall be geocoded using the towfish position. Information and specifications on CARIS SIPS and data formats may be obtained from Universal Systems LTD.

Side Scan Contact Images

The hydrographer shall submit digital images of all significant side scan contacts within the contact list (see Section 8.4.2). Digital images shall be in a standard image format (e.g., tif, gif, jpg) and submitted on CD ROM (preferred) or 2 GB Jaz disk. The file name shall coincide with the contact name as depicted on the contact list. Hard copy images of significant side scan contacts shall be included in the Separates.

Side Scan Mosaics

If mosaics are used to demonstrate side scan coverage (see Section 8.4.1. 1), the hydrographer shall submit a digital image file for each 100 percent coverage. The digital image file shall be in a standard geo-referenced image format, submitted on either CD ROM or 2 GB Jaz disk.

8.5.5. Other Data

Tide and Sound Velocity Data

The hydrographer shall submit tide data and sound velocity data applied to all Multibeam depths on either 3.5 inch floppy, CD ROM or 2 GB Jaz disk. The hydrographer shall identify the data format and all data element descriptions (e.g., ASCII text file or Excel spreadsheet file; date/time referenced to UTC, tide relative to MLLW datum to the nearest centimeter).

Vessel Configuration File

The hydrographer shall submit a CARIS-for-Unix-compatible Vessel Configuration file (VCF) for each vessel used during survey operations. CARIS-compatible VCF shall contain those static and dynamic correctors and offsets which are to be applied to the raw Multibeam data set submitted as referenced in Section 8.5.3. Information and specifications on the vessel configuration file format may be obtained from Universal Systems Ltd. VCF files shall be submitted on either 3.5 inch floppy disk, CD ROM, or 2 GB Jaz disk.

Digital Plot Files

Digital plot files are required for the preliminary smooth sheet and overlays. The format shall be HPGL/2. Digital plot files shall be submitted on either CD ROM (preferred), 2 GB Jaz disk, or on one of the tape media described in Section 8.5.1.

